TECHNICAL VOLUME

BIL – GRID RESILIENCE AND INNOVATION PARTNERSHIPS (GRIP) PROGRAM

DE-FOA-0002740

TOPIC AREA 2: SMART GRID GRANTS

CITY OF NAPERVILLE, NAPERVILLE ELECTRIC UTILITY DISTRIBUTED ENERGY RESOURCE MANAGEMENT SYSTEM (DERMS) IMPLEMENTATION & INTEGRATION

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Naperville

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Department of Energy (DOE)

Grid Deployment Office (GDO)

Office of Clean Energy Demonstrations (OCED)

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PROJECT OVERVIEW

Project Title – NEU Distributed Energy Resource Management System (DERMS) Implementation & Integration
Topic Area 2 – Smart Grid Grants

Naperville Electric Utility (NEU), a municipally owned electric utility (*classified as a "small utility" per DOE criteria*[1]), is located 28 miles west of Chicago and is home to over 149,000 residents consistently ranking as a top community in the nation in which to live, raise children and retire. Established for over 120 years, NEU has long been committed to proactive advancement of its grid in support of the health, welfare, and growth of the city it serves. The City thrives on its high-tech industry, with many companies headquartered in Naperville. Naperville is also near Fermilab and Argonne National Laboratory, further establishing itself as a home to scientific development.

To manage the rapidly growing quantity of new generation, storage, and electrification assets being introduced onto NEU's grid (*which have now been further catalyzed by renewed production incentives included in the Inflation Reduction Act)* and to support the State of Illinois' clean energy supply transition to 100% clean, renewable energy by 2050, Naperville is seeking in this application to deploy a robust **Distributed Energy Resource Management** (DERMS) platform to be used in NEU's 24x7 control room, allowing greater visibility, monitoring and control of Distributed Energy Resource (DER) production and growth scattered across its system, support broader load control and Conservation Voltage Reduction programs, and to better inform and support future distribution system investment planning. ('Project'). This Project includes over a 3-year period:

- **The evaluation of Naperville's current systems**, performance of the appropriate upgrades to those systems,
- **The implementation of a DERMS system** that is integrated and interfaces with existing legacy NEU systems, such as NEU's SCADA and GIS, and
- **Testing and Validation** of the DERMS system, as well as performance of user training to ensure NEU personnel are able to use the system effectively.

NEU has long been focused on continuous improvement, innovation, and driving initiatives. This is done through both encouragement and expansion of solar producers and solar projects as well as providing incentives and rebates to support electric vehicle infrastructure for residential & non-residential use (e.*g a $700 rebate for a Level 2 or Level 3 Electric Vehicle Charging Station for residential use and up to a $500 rebate for a Level 2 or Level 3 EVCS for non-residential use*.)

The City of Naperville has the second highest number of electric vehicles within Illinois, only behind Chicago, with approximately **2,221 EV's** to date in the community (*which has more than quadrupled since 2019 and is expected to grow further with renewed EV incentives*).

[1] Small utilities are defined as entities that sell no more than 4,000,000 MWh of electricity per year as outlined in FOA DE-FOA-0002740

There are also currently **20 battery installations** by Naperville customers providing over 230 kw of total capacity, and over **550 solar producers** (and growing monthly) spread across the territory, including several large non-residential projects funded by Naperville's Renewable Energy Grant Program[2] such as:

- **165 solar panel installation** at the Municipal Center, which has generated 273 MWh[3] of energy over its lifetime and powers the Naperville Jaycees Park.
- **North Central College 1,623 solar PV panels + energy storage system** on the roof of the Residence Hall/Recreation Center, providing 22% of the electricity for the building.
- **117 solar panel installation at Naperville Park District's Fort Hill Activity Center**, which can produce approximately 40,000 kWh of energy annually, enough to power 130 LED light fixtures in the Activity Center for one year.
- **45 solar panels** on the south-facing roof of Naperville Park District's Nike Sports Complex, helping to power lights at the park.

The successful implementation of a DERMS project will allow NEU to increase both its visibility of growing distributed assets hitting the grid, but also the ability to actively manage and respond to this growth in a manner that will assure limited disruption to grid operations.

Having successfully managed and deployed projects leveraging federal funding the past and in delivering large scale utility software management platforms, and with several current staff having supported prior awarded Smart Grid Investment Grant funding in 2009, Naperville has the demonstrated ability and the current available people, resources, and processes in place to deliver on NEU's proposed **DERMS implementation initiative.**

NEU PROJECT VISION & DOE FUNDING IMPACT

NEU's vision for this Project aligns with the core intent of the Smart Grid Grants as described in the FOA, which is to **catalyze technology solutions** that increase the **flexibility, efficiency, reliability, and resilience** of the electric power system.

All Project components in this application support this objective, as well as facilitate the DOE definition of enabling 'Smart Grid functionality'.

Project Vision Statement: In order to support Illinois clean energy supply transition to 100% clean, renewable energy by 2050 and to meet the increasing levels of solar installations over the next several years which have now been further catalyzed by renewed production incentives included in the Inflation Reduction Act, Naperville is seeking to deploy a robust Distributed Energy Resource Management platform, allowing greater visibility, monitoring and control of DER production and growth scattered across its system, as well as to support future distribution system investment planning.

[2] https://www.naperville.il.us/services/electric-utility/powering-our-community-for-the-future/energy-efficiency-grant-programs/non-residential-renewable-energy-grant-program/
[3] https://www.solrenview.com/SolrenView/mainFr.php?siteId=5407

NEU's primary outcomes for the Project are summarized as follows:

1. To align with and support Illinois clean energy supply transition commitments to **100% clean, renewable energy by 2050**.
2. To better facilitate the increasing levels of **two-way intermittent generation sources permeating Naperville's grid** that can prove disruptive at scale if not monitored or managed appropriately.
3. To catalyze community transformation and spur future investment by increasing grid hosting capacity for future DERs and working with the **Naperville Development Partnership** and **Naperville Chamber of Commerce** to attract new commercial investment and development off the merits a modern & resilient grid brings.
4. To drive **real, tangible community benefits** both in the increased flexibility of the grid which is a direct outcome of the Project, while also supporting broader Naperville economic development growth, and furthering energy democracy initiatives within the community and beyond.

Impacts from DOE Funding

NEU has consistently been a driver of innovation, with an appetite to adopt, implement and reap demonstrable, quantifiable benefits from newer technologies. NEU was one of the only small utilities to receive SGIG funding in 2009, and was one of the first utilities to successfully implement Conservation Voltage Reduction (CVR) across its system when the technology was still in its early stages of maturity.

With that, this project is on the bleeding edge technology with limited number of examples to follow (e.*g Sacramento Municipal Utility District*). DOE funding will allow NEU to fully explore the available technology options and move forward to be prepared for proliferation of renewable resources.

Based on NEU's experience with our SGIG-funded Smart Grid project, NEU learned that it takes years to fully take advantage of capabilities of new technology and bring benefits of it to the community. DERMS funding will help Naperville to be an early adopter, quickly learn, and sooner enable the appropriate much-needed functionality to help fully manage and plan for its fast-growing DER and EV community.

The Project is seeking approximately **$1.1 million in DOE funding** to support this **$2.2 million dollar deployment over 3 years,** which due to the described needs above & the investment would allow NEU to:

1. **Reduce deployment risks** by alleviating the financial and resource burden to performing the appropriate DERMS diligence with vendors and other successfully deployed systems, allowing the project to occur on a sooner than originally planned timeframe.
2. **Fund additional utility integrations to systems** that otherwise would not have been possible due to financial limitations; These integrations will help broaden the associated benefit opportunities and impacts a DERMS can bring.

Given NEU's early mobilization of its grant-project evaluation team in Dec 2021, substantial diligence has already been performed to align with City Leadership, NEU engineering teams, and prospective vendor and contractor partners; NEU has also successfully managed and deployed complex projects leveraging significant federal funding in the past[4], and as such is intimately familiar with what is required to be a strong steward of DOE Smart Grid grant funding awards.

Catalyzing Community Impact & Benefits

Naperville understands that thoughtful and meaningful community benefit is a critical outcome required for this funding, spanning not just grid-benefitting operational improvements, but also in advancing energy democracy, workforce development, and community partnerships.

Aside from the fact, a DERMS system will increase NEU's ability to host additional community owned DER's and EV's in the future, as a municipally owned utility, NEU is **inherently aligned and committed** to making prudent investments towards the advancement of and in partnership with the community and residents it serves.

This partnership is formalized and bound by the fact the utility is **locally owned, controlled and managed**, with investments pursued by the utility reviewed and approved by the **Naperville City Council**. The Naperville City Council is additionally supported by the **Public Utility Advisory Board (PUAB),** with appointments reserved for Naperville residents and are made by the Mayor and City Council. Through collaboration with identified partners and key Naperville community stakeholders, the following are identified incremental Community Benefits & Engagement NEU expects to deliver in this Project, further expanded on in the **Community Benefits Plan** portion of this application:

Table 1 Community Benefit Milestones & Engagement Activities

Activity Description	Benefit Category
Naperville Development Partnership (NPD) partnership with NEU through **quarterly commitments** to share employment opportunities that arise from this effort, provide a construction update as well as share the upcoming year's plan for deployment of grant dollars. NPD will market NEU's project as part of its standard materials.	**Workforce Development / Community Engagement**
NEU partnership with Naperville Chamber of Commerce (501C(6) non profit, 1100 chamber members and one of the largest Chambers in Illinois) to **provide quarterly engagements** throughout Project deployment.	**Workforce Development / Community Engagement**
City as Service Provider – Led by Naperville's DEIA manager, deploy citizen surveys in 2024, regarding Electric and other City Services stemming from this Project Deployment, and use results as a tool to improve services to all residents.	**Advancing DEIA / Community Engagement**
Collaborative Youth Team, Public Library, School Districts 203 & 204 engagement to share Project details, introduction to grid technologies, and bring greater awareness between the City, NEU, and the public/community.	**Advancing DEIA / Community Engagement**

[4]https://www.energy.gov/sites/prod/files/2017/08/f35/The_Naperville_Smart_Grid_Initiative_Case_Study_201008_0.pdf

NEU Project Team will be **100% complete** by Project initiation on the newly developed Employee Learning & Development focused on 4 courses: (1) Fostering Inclusion and Belonging, (2) Bias (3) Living our Core Values, and (4) Inclusive Leadership	**Advancing DEIA**
Partner with Accelerate Climate Solutions **to help** low-income residents and senior citizens **in the community, to help our community** adopt programs and technologies that address climate change.	**Community Engagement / J40 Initiatives**
Leverage Union Workforce from IBEW Local 9 for Project scope, and as per existing agreements in place covering January 1, 2021 – December 21, 2025.	**Fair Labor, Jobs & Unions**
In cooperation with **IBEW Local 9**, NEU implemented a line worker apprenticeship program to locally develop and invest in a qualified workforce.	**Fair Labor, Jobs & Unions**
Advance Naperville's **Emerging Leaders Program**, a 6-week certification series that allows participants to engage with local leaders to learn how not-for-profit, municipal, and private sectors combine forces to create economic development, improve community and government relations, healthcare and public services.	**Workforce Investment**
Engineering internships at NEU - fund two internships annually to provide young engineers the opportunity to gain exposure and experience in the industry, and determine opportunities to engage with this Project.	**Workforce Investment**

Naperville Climate Resilience Strategy

As an infrastructure company providing critical services, climate resiliency is already at the core of NEU's ethos. In accordance with the National Climate Assessment recommendations, NEU continues to assess its infrastructure to avoid cascading critical system failures by implementing redundancy and robust standards to withstand thermal extremes, intense wind speeds, and heavy rainfall. Locally, in Greater Chicago, the Federal Emergency Management Agency (FEMA) National Risk Index reports regional high hazard risk for temperature extremes, strong winds, tornados, ice storms, and winter weather – many of these events have recently caused billion-dollar disasters as reported by NOAA's database. To adapt and respond to these consequential climate projections, NEU's climate resilience strategy can be characterized by **two major actions**:

1. **PRUDENT UTILITY PLANNING & INFRASTRUCTURE INVESTMENTS.** As an electric utility, NEU builds to critical infrastructure standards to ensure safety and reliability not only as materials degrade but to account for changing climate conditions. Naperville currently has over 1,200 miles of electrical cable with nearly **94% of this infrastructure underground**, which is significantly less susceptible to damage from extreme winds, derechos, and other frequent local weather hazards. Additionally, NEU has automated **88% of its system with Distribution Automation (DA)**. Despite several extreme weather events in 2020 and 2021, NEU continues to see improvement of System Average Interruption Duration (SAIDI) metrics with less frequent and shorter outages resulting from its historical resilience and automation investments – DA investments, have led to **approximately 25% SAIDI improvement** historically for NEU. This Project, while primarily software focused, enhances NEU capabilities to respond to climate issues, allows for greater hosting capacity for DERs & a 'Virtual Power Plant' capability.

2. **COMMUNITY ENGAGEMENT & LOCAL ACTION.** NEU regularly engages with the **Naperville Environment and Sustainability Task Force (NEST)** which is a city-endorsed official task

force made up of City leaders and community stakeholders. The core 15-year vision of NEST recommends incremental transitioning to a cleaner, more efficient, less wasteful, environmentally robust, economically sound, and just, healthy, inclusive, resilient community. These strategies include encouraging community solar generation and the expansion of DERs, microgrids, and promoting clean mobility infrastructure – all of which require a resilient, modern system to successfully operate. NEST's Climate Resilience planning is rooted on principles outlined in the UN Habitat's '**Guiding Principles for City Climate Action Planning'**[5] As part of this project, **NEU is committing to regular engagement touchpoints with NEST** to assure new infrastructure deployed aligns with NEST's Climate Action Plans.

TECHNICAL DESCRIPTION, INNOVATION & IMPACT

In this program application, NEU is seeking deploy and integrate a software-based Distributed Energy Resource Management System (DERMS) for NEU's 24x7 Control Room of the future. The DERMS system will interface with NEU's existing Supervisory Control and Data Acquisition System (SCADA), Outage Management System (OMS) and if appropriate, the Geographical Information System (GIS) and Automated Metering Infrastructure (AMI).

With constrained financial resources, Naperville seeks funding provided in this grant to help drive the DERMS implementation to completion and on an expedited time-schedule that **otherwise would not be possible without DOE funding**.

PROJECT RELEVANCE & GRID BENEFITTING OUTCOMES

The scope of this program effort includes the engagement of a DERMS vendor to support the initial evaluation of NEU's legacy systems, support and execute on any recommendations for upgrades and replacement and perform the on-site installation and integration of the DERMS system, complete with training of NEU staff and operators.

The system, when put into service, will support the aggregation and integration of distributed energy resources and other "grid edge" devices to provide NEU system benefits, such as promoting the expansion of renewable energy resources, electric vehicle charging infrastructure, and smart building and home technologies.

Table 2 Proposed DERMS Implementation Components

COMPONENT	DESCRIPTION
DERMS Vendor Engagement	Engage with DERMS vendors to evaluate the current market offerings, evaluate technologies, cost and successful deployments and alignment with core requirements, including assurance of strong Cyber Security positions (i.e support IEEE 2030.5)
NEU System(s) Evaluations & Upgrades	Perform system requirement evaluation with DERMS vendor support to understand integration requirements to existing systems, opportunities/needs to upgrade. Define the DERMS deployment functionality-based phases based on ROI of each incremental functionality.

[5] https://unhabitat.org/guiding-principles-for-city-climate-action-planning

Implementation & Upgrades	Vendor implements the DERMS interfaces and integrations to the defined legacy systems to exchange data, deploys primary functionality defined in the initial phases, and performs required upgrades on legacy systems as needed.
Post-Implementation Support & Training	Vendor will provide training for NEU personnel and any immediate post deployment support.

Grid Benefitting & Outcomes

With increasing distributed generation and storage sources across the grid becomes an ever-increasing need for NEU to be able to measure, monitor, and control these new disparate and intermittent generating assets such that they do not disrupt grid operations. (see following Figures on EV and Solar growth within NEU's territory)

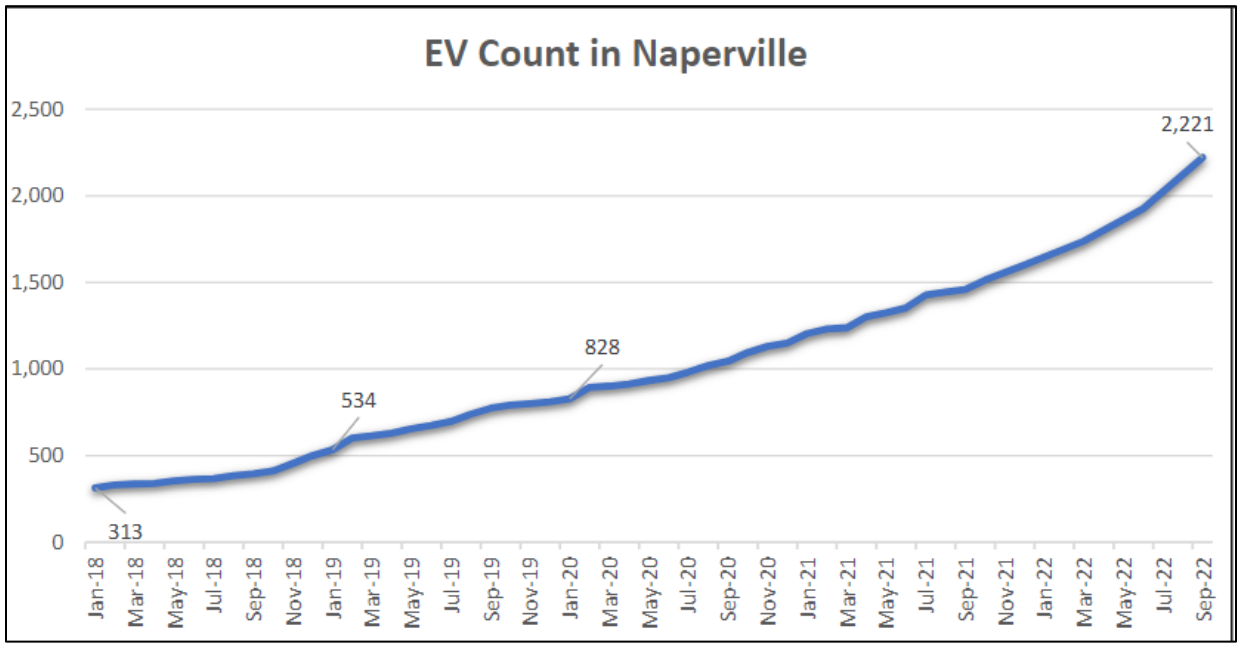

Figure 1 Naperville EV Count (As of 9/30/22)

Current grid technologies are primarily equipped to manage continuous generation and one way flow of electricity – the frequency disruptions caused by intermittent generation and two-way power flow can inadvertently stress the grid, causing voltage issues and brownouts or blackouts.

At the distribution level, DERs can provide challenges around hidden load, backfeeds, and voltage issues. Hidden load refers to the share of consumption covered by embedded generation, therefore not directly visible to the grid operator whose traditional operation systems only manage "net load", the net flow on the power lines.

Accurate visibility of the two components of the net load (native consumption and embedded generation) is essential to many core Distribution grid management processes. For instance, upon a fault, ensuring that a faulty feeder is de-energized is paramount for the safety of

workers in charge of the repair. As such, NEU operators need to be aware of every single PV rooftop and fully comprehend its connection/ disconnection status.

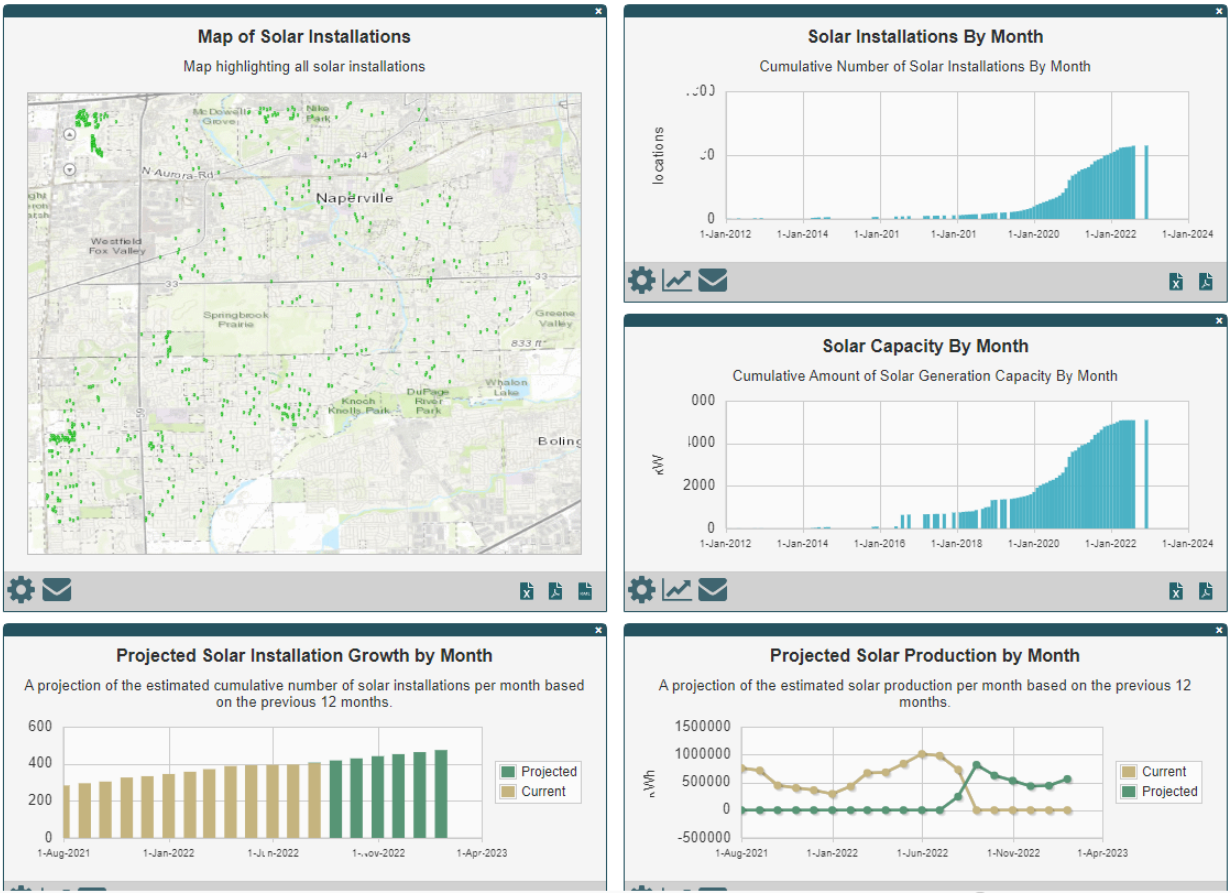

Figure 2: Naperville Solar Proliferation Dashboard

This Project will support the following key grid-benefitting outcomes for NEU:

1. **Greater Grid Visibility & Flexibility.** Provides the Naperville Electric Utility 24x7 Control Room with capability to monitor and control distributed energy resource production, to assure power quality and safety of utility operations
2. **Encourages Future DER Deployment.** Promotes and support the deployment of commercial and residential renewable energy resource and energy storage within the city by increasing hosting capacity.
3. **Dynamic Grid Capacity Response.** Serves as a Virtual Power Plan (VPP), to help support management of energy peak/demand response events
    a. Aggregation and Control of Solar Installations
    b. Aggregations and Control of Energy Storage
    c. Management of Stand-by Generators
    d. Management of Vehicles Charging Stations
4. **More Efficient Management.** Single software platform for performing all DERMS management functions (single pane of view)

Alignment with Grant Objectives

Topic Area 2, as described in the Funding Opportunity Announcement (FOA), is intended to focus on enabling Smart Grid functionality, and on solutions that catalyze technology solutions to increase the flexibility of the power system. NEU's DERMS implementation project is aligned with the grant program's four outlined key objectives as described below:

Table 3 Topic Area 2 Key Objectives Alignment

Topic 2 Key Objectives	NEU DERMS Project Alignment
Integrate variable renewable energy resources at the transmission and distribution levels;	The NEU DERMS system allows for significantly improved monitoring, measurement, and control of DERs, charging stations, and control of batteries, thermostats, hot water tanks, as well as the deployment of CVR. Given the intermittent nature of DER generation, the DERMS system will allow NEU control room operators to curtail and rebalance the grid as needed, avoiding customer voltages from exceeding acceptable ranges.
Facilitate the aggregation and integration (edge-computing) of electric vehicles and other grid-edge devices or electrified loads.	A DERMS system's core purpose is to aggregate and manage groups of DER sources on a utility's system. NEU will integrate the system with other key software systems in place such as NEU's SCADA, OMS, GIS, and AMI helping build a comprehensive view of the distribution system plus any grid edge devices.
Increase the capacity of transmission facilities or the capability of the transmission system to reliably transfer increased amounts of electric energy;	NEU, while not a transmission system operator, will through this DERMS project, be able to curtail load as well as encourage an increase in distributed generation sources, both of which will relieve capacity requirements on the transmission system.
Prevent faults that may lead to wildfires or other system disturbances;	A DERMS system allows NEU to better manage the increasing amounts of DERs on its grid, which due to their intermittent nature, can create system disturbances without the appropriate oversight, measurement, and control.

Additionally, of the listed **priority investments** outlined by the DOE for Topic 2, NEU's DERMS program aligns with the following:

Table 4 Topic Area 2 Priority Projects Alignment

Topic Area 2 Priority Investments	
Increasing transmission capacity and operational transfer capacity through grid enhancing technologies such as dynamic line rating, flow control devices, advanced conductors, and network topology optimization, to improve system efficiency and reliability.	
Improving the visibility of the electrical system to grid operators, to help quickly rebalance the electrical system with autonomous controls, through data analytics, software, and sensors.	✓
Enhance secure communication and data flow between distribution components, through investments in optical ground wire, dark fiber, operational fiber, and wireless broadband communications networks damage.	
Aggregation and integration of distributed energy resources and other "gridedge" devices to provide system benefits, such as renewable energy resources, electric vehicle charging infrastructure, vehicle-to-grid technologies and capabilities, and smart building technologies.	✓

Enhancing interoperability and data architecture of systems that support two-way flow of both electric power and localized analytics to provide information between electricity system operators and consumers.	✓
Anticipate and mitigate the impacts of extreme weather or natural disaster on grid resiliency, including investments to increase the ability to redirect or shut of power to minimize blackouts, prevent wildfires, and avoid further	

And lastly, of the listed 13 remaining qualifying investments in the FOA, the NEU DERMS program meets the following **4 items**:

Table 5 Topic Area 2 Qualifying Investments Alignment

Topic Area 2 Remaining Qualifying Investments	
In the case of appliances covered for purposes of establishing energy conservation standards under part B of title III of the Energy Policy and Conservation Act of 1975,38 the documented expenditures incurred by a manufacturer of such appliances associated with purchasing or designing, creating the ability to manufacture, and manufacturing and installing for one calendar year, internal devices that allow the appliance to engage in Smart Grid functions.	
In the case of specialized electricity-using equipment, including motors and drivers, installed in industrial or commercial applications, the documented expenditures incurred by its owner or its manufacturer of installing devices or modifying that equipment to engage in Smart Grid functions.	
In the case of transmission and distribution equipment fitted with monitoring and communications devices to enable smart grid functions, the documented expenditures incurred by the electric utility to purchase and install such monitoring and communications devices.	
In the case of metering devices, sensors, control devices, and other devices integrated with and attached to an electric utility system or retail distributor or marketer of electricity that are capable of engaging in Smart Grid functions, the documented expenditures incurred by the electric utility, distributor, or marketer and its customers to purchase and install such devices.	
In the case of software that enables devices or computers to engage in Smart Grid functions, the documented purchase costs of the software.	✓
In the case of entities that operate or coordinate operations of regional electric grids, the documented expenditures for purchasing and installing such equipment that allows Smart Grid functions to operate and be combined or coordinated among multiple electric utilities and between that region and other regions.	
In the case of persons or entities other than electric utilities owning and operating a distributed electricity generator, the documented expenditures of enabling that generator to be monitored, controlled, or otherwise integrated into grid operations and electricity flows on the grid utilizing Smart Grid functions.	✓
In the case of electric or hybrid-electric vehicles, the documented expenses for devices that allow the vehicle to engage in Smart Grid functions (but not the costs of electricity storage for the vehicle).	✓
In the case of data analytics that enable software to engage in Smart Grid functions, the documented purchase costs of the data analytics.	
In the case of buildings, the documented expenses for devices and software, including for installation, that allow buildings to engage in demand flexibility or Smart Grid functions.	✓
In the case of utility communications, the documented expenditures incurred by the electric utility to purchase and install operational fiber and wireless broadband communications networks to enable data flow between distribution system components.	
In the case of advanced transmission technologies such as dynamic line rating, flow control devices, advanced conductors, network topology optimization, or other hardware, software, and associated protocols applied to existing transmission facilities that increase the operational	

transfer capacity of a transmission network, the documented expenditures to purchase and install those advanced transmission technologies.	
In the case of extreme weather or natural disasters, the documented expenses for monitoring, control devices and other equipment that enable the ability to redirect or shut off power to minimize blackouts and avoid further damage.	

This program additionally will catalyze community transformation and spur future investment - a robust DERMS system enables NEU to continue to encourage and ramp-up customer DER projects, storage projects, and EV infrastructure deployments, setting the foundation for the next generation of utility needs and ever-evolving customer requirements.

Having been a recipient of the Smart Grid Investment Grants in 2009 which are being renewed through this grant, NEU understands the 'solution-based' nature of these investments, focusing not just on the component functionality, but how NEU will be able to operationalize and use it appropriately such that benefits are maximized. NEU is equipped today with experienced professionals, as well as the surrounding processes & existing technologies to successfully do so, just as it had done in 2009.

The initial AMI and smart metering deployments funded in 2009 are foundational to and will be leveraged alongside the proposed DERMS system NEU is seeking funding for in this application, demonstrating NEU's commitments to both maximizing investments for the benefit of the community, while also remaining future-focused.

TECHNICAL FEASIBILITY

NEU understands that DERMS is a newer application, and as such has already engaged with the **Sacramento Municipal Utility District** staff that is implementing DERMS to learn more about their experience, best practices, lessons learned, and use-case realization, all of which will be leveraged to replicate success at NEU.

Table 6 Lessons Learned From Sacramento Municipal Utility

Item	Insight
Support Requirements	Long term support the system would require at least 2-4 FTEs to support the DERMS moving forward. NEU will be diligent during requirements building to also adjust staffing plans.
Pre-requisite Upgrades	SCADA should be upgraded first along with an integrated DMS prior to a deployment. NEU will be performing its SCADA and DMS upgrades in advance of this Project.
Organizational Transformation	New processes and procedures will need to be developed to manage changes across the organization. NEU, through its requirements diligence and gathering, will consider as part its requirements, the impacts on the organization.

NEU has demonstrated success in delivering on Smart Grid programs funded by the DOE, having been awarded $11M under the 2009 Smart Grid Investment grants (SGIG) and meeting all associated DOE performance targets over the deployment period. This deployment has

included the successful implementation of the AMI headend and Meter Data Management System (MDMS) application.

NEU additionally has a fully deployed SCADA system, OMS, and GIS system. All of these systems are supported by NEU staff capable of managing these applications. The implementation of the DERMS would follow NEU's existing best-practices for system and software deployments. Existing successfully deployed systems at NEU Include:

- **SCADA (Advanced Control Systems)** provides control and data acquisition for 16 substations operation
- **Distribution Automation (S&C Electric)** provides automatic reconfiguration and remote control to key distribution switches along 12.5 KV feeders.
- **Conservation Voltage Reduction** integrated with AMI and SCADA (DVI, Dominion Energy)
- **City-wide Fiber Optic Backbone Ring** (monitors by GE JungleMux)
- **AMI(Honewell/Elster Axis Detect)** provides access to customer meter status.
- **ArcFM (Schneider Electric)** provides several modules including distribution network, ductbank network, fiber management network, and design tools used by engineering section.
- **Outage Management System** (Schneider Electric) integrated with SCADA, AMI and CIS

NEU is committed to expand and scale its investment efforts far beyond the FOA-defined performance period to support the next generation of Naperville's community, **just as it has done with past Federal investments received.**

Cyber Security Plan

NEU has maintained a focus on both interoperability and cyber security to ensure that the smart grid devices and associated software applications are supported through the entire lifecycle of each device. NEU has identified all subsystem and application interfaces (physical, human, and application interfaces) and identified the key standards and cyber security policies to secure the data going across these interfaces from external and internal attacks. The following are NEU's standard cybersecurity practices:

1. Perform regular internal and external vulnerability scanning; 2. Perform planned 3rd party security assessments; 3. Policies are under development to guide information security; 4. Maintain investments in an industry leading endpoint protection, best of breed IDS/IPS, next generation firewalls with traffic inspection, a recognized multi-year leader in Gartner SIEM technology; 5. Maintain a Formal Incident Response Plan with a joint cyber task group component with City IT; 6. Bi-weekly Network Security Meetings with City IT to discuss current threats; 7. Budgeted Training for Security; 8. Subscription/follow E-ISAC for emerging cybersecurity/OT threats.

Prior to award, Naperville's Cybersecurity Team will update its existing Security Handbook to account for Project scope, ensuring clear life-cycle management processes are outlined for all equipment and applications. The handbook is based on several best-in-class security sources, including the NERC-CIP security requirements for the Department of Energy – Office of Basic

Energy Sciences (DOE BES), as well as network security strategies implemented for financial institutions. This handbook will be a living document updated on a planned basis through internal audits, and information garnered from NIST, GridWise, EPRI, and the utility industry.

INNOVATION & IMPACTS

NEU's commitment to continuous improvement is engrained within the utility and its core mission, as well as within the community itself, having long proven itself to be a hub for technical innovation and growth with technology companies such as the Nokia global data center, Tellabs, Nalco Water (an Ecolab company), and others being located within Naperville.

Advantages of Proposed Technology vs. Current Deployments

The DERMS program demonstrates NEU's current innovation – it leverages the foundational data and network available through its already-deployed AMI system, SCADA system, OMS, and GIS systems to drive significant incremental value, meeting a fast-growing need in the community with the appropriate technology solution.

The project will spur additional innovation as it refines its curtailment and control programs using the analytics available with the DERMS software, as well as being able to more efficiently account for the stresses introduced from DERs and EV's when performing its long-range distribution and capacity engineering planning going forward.

Table 7 Proposed Technology Advancements

Current State	Future State Advantages
Disparate Systems Lacking 'Holistic View' and management of DER assets	Provides system wide visibility and control of DER assets to reduce the challenges that arise from having "hidden load" dispersed on Naperville's grid. A DERMS system will support modeling, monitoring, forecasting, and scheduling across the board, in a consistent and orchestrated manner.

SUPPORTING STATE, LOCAL, COMMUNITY & REGIONAL GOALS

NEU formally supports the following energy goals and continuously is working to achieve them in the community and in collaboration throughout the region: ***1. Advance renewable energy 2. Enact policies that support clean energy;*** and ***3. Engage the community in clean energy practices.***

Illinois State Resiliency & Climate Objectives Alignment

NEU is aligned with Illinois state level climate and resiliency initiatives. On January 23, 2019, Governor Pritzker signed Executive Order 2019-06 entering Illinois in the U.S. Climate Alliance, a group of states committed to reducing greenhouse gas (GHG) emissions consistent with the United Nations Paris Agreement. Additionally, the Climate and Equitable Jobs Act (CEJA), Public Act 102-0662, was signed into law by Governor Pritzker on September 15, 2021. CEJA establishes as policy of the State of Illinois to move toward 100% clean energy by 2050 and puts the state on a path to 40% renewable energy by 2030 and 50% by 2040. Upgrading its system to

fit these modern needs will assure Naperville has the foundation to quickly incorporate these new assets effectively and efficiently.

Naperville Community Initiatives & Goals: Sustainable Naperville 2036

At a local level, NEU regularly collaborates with community stakeholders and City leadership to provide input on NEU's role in advancing Naperville's sustainable objectives, expansion of clean energy and storage, and the infrastructure support for increased electric vehicle adoption.

The **Naperville Environment and Sustainability Task Force (NEST),** a city-endorsed official task force made up of City leaders and community stakeholders including NEU leadership, published in 2021 the ***NEST Community Clean Energy*** report.[6] The core 15-year vision of NEST recommends incremental transitioning to a cleaner, more efficient, less wasteful, environmentally robust, economically sound and just, healthy, inclusive, resilient community, where by 2036 Naperville is fueled by 100% clean energy. These strategies include encouraging community solar generation and the expansion of DERs, microgrids, and promoting clean mobility infrastructure (*Fossil fueled transportation is the second largest contributor to GHG emissions from the community at 24%, only behind electricity generation at 54%*) – all of which require a resilient, modern system to successfully operate.

[6] Naperville Environment and Sustainability Task Force (NEST), *NEST Community 100% Clean Energy by 2036* https://www.sustainnaperville.org

WORKPLAN

Buy America Requirements. NEU, as part of a defined "non-Federal entity," is subject to the Buy America Requirements as outlined in the Funding Opportunity Announcement (FOA). This project, being software based, does not have components subject to the Buy America provisions which apply primarily to construction or physical material.

WORK BREAKDOWN & MILESTONES

NEU's proposed Project workplan for DERMS deployment is described in the following sections.

Phase 0 & 1 Requirements Development, RFP Solicitation, & Standup New DERMS

In the initial Phases of RFP solicitation and Vendor selection, NEU will require experienced vendors to evaluate NEU's existing SCADA system and recommend if additional upgrades or replacements are necessary to support DERMS.

Task #	Task Name	Start	Finish
0	Finalize Requirements, Vendor Engagement, RFP Solicitation	06/23/26	06/21/27
1	Phase 1 - Standup New DERMS	06/21/27	10/23/28
1.1	**Design**	10/26/27	02/14/28
1.1.1	Detailed Architecture Design	10/26/27	11/22/27
1.1.2	Integration Interface Design	11/23/27	12/20/27
1.1.3	Use Case and Workflow Design	12/21/27	01/17/28
1.1.4	Infrastructure Preparation	01/18/28	01/31/28
1.1.5	Cybersecurity Assessment and Requirements Definition	02/01/28	02/14/28
1.2	**Deployment**	02/29/28	05/22/28
1.2.1	Cloud/Onprem deployment	02/29/28	03/13/28
1.2.2	Infrastructure Provisioning (Test and Prod environment)	03/14/28	04/10/28
1.2.3	Software Package Deployment	04/11/28	05/01/28
1.2.4	Networking and Cybersecurity Configurations	05/02/28	05/22/28
1.3	**Systems Integration**	05/23/28	07/17/28
1.3.1	Set up connection and data flow with SCADA	05/23/28	06/05/28
1.3.2	Set up connection and data flow with field DERs	06/06/28	06/26/28
1.3.3	Set up connection for network model ingestion with GIS/S	06/27/28	07/17/28
1.4	**Testing**	06/21/27	10/23/28
1.4.1	Systems Integration Test Plan Development	02/15/28	03/06/28
1.4.2	User Acceptance Test Plan Development	03/07/28	03/27/28
1.4.3	Test Plan Deliverable	03/07/28	03/13/28
1.4.4	SIT Testing	08/08/28	08/21/28
1.4.5	**SIT Completion**	08/22/28	08/28/28
1.4.6	User Training and Acceptance Testing	08/29/28	09/18/28
1.4.7	**UAT Completion**	09/19/28	09/25/28
1.4.8	Core Go Live	06/21/27	06/21/27
1.4.9	Stabilization & Operations period	09/26/28	10/23/28

Figure 3 Phase 0 & 1 Workplan

Phase 2- 3 Validate New DERMS & Transition to Support

Task #	Task Name	Start	Finish
2	Phase 2 - Validate New DERMS (Buffer for Performance/Val	10/23/28	03/05/29
2.1	Test Plan Updates	10/24/28	11/13/28
2.2	Test Plan 2 Deliverable	11/14/28	11/20/28
2.3	Software Update	11/21/28	11/27/28
2.4	Deployment to Test Server	11/28/28	12/04/28
2.5	**Patch Test (SIT#2)**	12/05/28	12/18/28
2.6	Deployment to Prod Server	12/19/28	12/25/28
2.7	**Patch Test (UAT #2)**	12/26/28	01/22/29
2.8	Patch Go Live	10/20/27	10/20/27
2.9	Stabilization period	01/23/29	03/05/29
3	**Transition to Support**	03/06/29	04/16/29

Figure 4 Phase 2 & 3 Workplan

Project Management & Reporting

Task #	Task Name	Start	Finish
4	**Project Management & Reporting**	**Award negotiations**	**On-Going**
4.1	**Project Management Plan (PMP)**	**Award negotiations**	**30 days from award**
4.2	**National Environmental Policy Act (NEPA) Compliance**	**Award negotiations**	**NEPA complete**
4.3	**Cybersecurity Plan (CSP)**	**Award negotiations**	**Award**
4.4	**Continuation Briefing(s)**	**Quarterly**	**Project Completion**

Figure 5 Project Management & Reporting Workplan

Technical Milestones

Table 8 Annual SMART Milestones & Go/No-Go Points

Period	Quarterly & Annual Milestones
Q1, Period 1	• Requirements gathering Initiated
Q2, Period 1	• Requirements gathering Completed
Q3, Period 1	• RFP Solicitation completed
ANNUAL, Period 1, Go / No-Go Milestones	• **Vendor Selected & SOW signed**
Q1, Period 2	• Detailed Architecture Design & Integration Design Completed
Q2, Period 2	• Use Case & Workflow Design Completed
Q3, Period 2	• Infrastructure Preparation Completed & Cybersecurity Assessment & Requirements Definitions Completed
ANNUAL, Period 2 Go / No-Go MIlestones	• **Design & Configurations 100% Complete** • **DERMS Deployment Initiated**
Q1, Period 3	• Cloud/Onprem deployment,
Q2, Period 3	• System Integrations Initiated (SCADA,DERS, GIS) • Network Model connections initatied
Q3, Period 3	• **SIT, UAT 100% completed and DERMS Core Go Live** • **Validation begins**
ANNUAL, Period 3 Go / No-Go Milestones	• **DERMS Patch Go-Live 100% Complete & Transition to Support Initiated** • **Final Project Closeout with DOE**

End of Project Goal

By end of Period 3 of this program, NEU will have livened a fully functional, tested, and integrated DERMS system, with relevant NEU staff 100% fully trained. Desired technical outcomes and supporting functionality include:

- Management of Energy Peak/Demand Response Events
- Aggregation and Control of Solar Installations
- Aggregations and Control of Energy Storage
- Management of Stand-by Generators
- Management of Vehicles Charging Stations
- Single software platform for performing all DERMS management functions
- Phased approach for deploying DERMS functionality-based ROI and community benefits
- Strong Cyber Security position (support IEEE 2030.5)

Project Schedule Summary

Table 9 Project Schedule Gantt Chart

		BP1				BP2				BP3			
Task	**Sub-Task**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
0, 1: Standup New DERMS													
0	Finalize Requirements & RFP Solicitation				M1								
1.1	Design												
1.2	Deployment							M2					
1.3	Systems Integration												
1.4	Testing												
2, 3: Validation & Transition to Support													
2.1	Test Plan Updates												
2.2	Test Plan 2 Deliverable												
2.3	Software Update												
2.4	Deployment to Test Server												
2.5	Patch Test (SIT#2)												
2.6	Deployment to Prod Server												
2.7	Patch Test (UAT #2)												
2.8	Patch Go Live												
2.9	Stabilization period												
3	Transition to Support												M3
4: Project Management & Reporting													
4.1	Project Management Plan (PMP)												
4.2	NEPA Compliance												
4.3	Cybersecurity Plan (CSP)												
4.4	Continuation Briefing(s)												

** BP1 estimated start in August 2023, ending Dec 2024. The following BPs will be 12 months*

Milestone

PROJECT MANAGEMENT PLAN

The program team will be staffed with NEU, contractor, and vendor resources. The **Program and Change Management Office (PCMO)** will be responsible for keeping the four key Project Teams on schedule as well as working with the Project Director to help to ensure that the other stakeholders and the Steering Committee are being kept abreast of progress. The PCMO will work very closely with the Project Team Leads and the Project Director to identify any issues that might cause the project to miss its schedule or objectives.

Project Team Overview

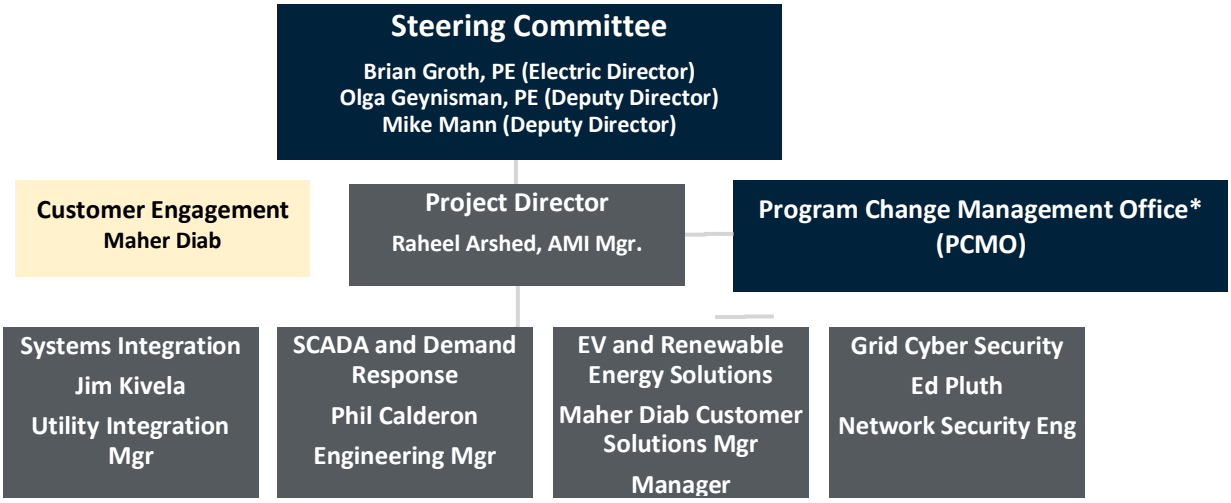

Figure 6 Program Team Structure

***Program Change Management Office (PCMO)** - NEU will establish a Program and Change Management Office that will provide overall support, coordination, and communication across project teams and Workstream Component leads. The PCMO team will be responsible for carrying out the following project management responsibilities:

- **Project Methodology:** The development and use of project management standards, delivery methods, and tools.
- **Status & Financial Reporting:** Providing the Department of Energy, City of Naperville City Council, and NEU Project leadership with an understanding of the current state of the project and underlying initiatives. The status reporting will include reporting against the initial work plan estimates, schedule, earned value, and projected future status.
- **Integrated Project Planning, Change Management & Interdependency Management:** The development and maintenance of an integrated project plan and the execution against that plan. This also includes planning, mapping, staffing, and scheduling of resources, & considering project interdependencies.
- **Risks & Issues Management:** Manage RAID log across entire program and individual projects to manage and address risks.

Identifying & Reducing Project Risks

The most common identified project risks are in the areas of inadequate project management, requirements management, funding and resource constraints, and vendor/supplier management. Based on these principles, the identified risks and mitigation strategies for this project include the following:

- **Requirements Management has been identified as the most significant project risk**. Having been aware of this DOE funding opportunity since its inception in late 2021 with the release of the Infrastructure Investment & Jobs Act, NEU has already performed significant planning on requirements and schedule that aligned with the intent of the grant. NEU will

utilize its Program and Change Management Office (PCMO) to ensure change of scope only happens through established procedures that are diligently managed.

- **New technology implementation**. NEU, as described previously, has engaged with other utilities that have successfully deployed a DERMS system. NEU will leverage lessons learned to both build strict requirements governing the RFP to ensure it captures these considerations, as well as ensure from an operational and long-term staffing perspective NEU will accommodate the new personnel needs that others have indicated will be required.
- **The compressed time frame of the project relies on vendors to be able to deliver their products on time and on budget**. The potential is that a vendor could become overwhelmed with multiple orders from multiple customers and placed in a position where they are unable to meet the schedule or budgetary requirements of their customers. This project is prepared to identify and utilize multiple vendors and technologies which are all interoperable to mitigate this risk.
- **There is a possibility that the existing labor force is insufficient to support the efforts spelled out in the project plan.** In our experience, there are numerous qualified and certified outside vendors and contractors in the Chicago area to supplement the existing internal work forces. With that, NEU has already engaged with a variety of vendors who have confirmed their ability to support this initiative. Through NEU's formal RFP process, Vendors will be selected based on their ability to support and deliver this project, bound by contractual terms.
- **Finally, there is the risk of failure to realize the 50% matching funds from NEU**. NEU will use cash and debt financing to cover its 50% share of the capital expenses. **NEU anticipates no issues in this regard.**

TECHNICAL QUALIFICATIONS & RESOURCES

Table 10 Core Program Team Descriptions & Experience

NAME	TITLE	DESCRIPTION OF ROLE / YEARS OF EXPERIENCE
Brian Groth	Director of Public Utilities - Electric	Program Director, Financial Administration, Political Liaison
Olga Geynisman	Deputy Director	General Program Oversight & Management
Mike Mann	Deputy Director	General Program Oversight & Management
Maher Diab	Customer Engagementl Mgr	Project Customer Engagement, Reporting & Community Benefits Oversight
Phil Calderone	Utility Engineering Manager	Project Director lead, oversight over project leads & coordination with PCMO; 9 years of experience
Dan Stephens	Utility Automation & Communications Manager	Project Director lead, oversight over project leads & coordination with PCMO; 14 Years with NEU Electric DPU, 9 years prior w/Automation
Raheel Arshed	Utility AMI Manager	AMI Integration; 15 years total with the NEU Electric DPU

Jim Kivela	Utility Integration Manager	Systems Integration, GIS, OMS
Edward Pluth	Network Security Engineer II	Supports Utility IT Infrastructure, 6 years of IT experience, 3 years with NEU Electric DPUE

NEU has completed projects of similar size and scope to the proposed initiative and has long-standing established relationships with contractors and vendors supporting this effort (*provided as letters of commitment*). These parties are summarized as follows:

Table 11: Contractors & Vendor Partners

VENDOR/CONTRACTOR	DESCRIPTION OF ROLE / PRODUCT / SERVICE
Equipment & Material Providers (Various)	Vendor and equipment providers will be finalized and selected if projects are formally awarded; Naperville has identified the possible potential vendors who might support a DERMS implementation: • Schneider Electric *(NEU is currently working with Schneider on the Outage Management System)* • OSI • GE

RELEVANT PREVIOUS WORK

The city of Naperville has existing project management, oversight, and governance resources and experience to both execute this project and support the on-going DOE requirements.

Naperville's 2009 Smart Grid Investment Grant Awards

In the Fall of 2009, the City of Naperville Smart Grid Initiative received **an $11 million Federal grant** from the **Smart Grid Investment Grant (SGIG) Program**, which was part of the American Recovery and Reinvestment Act of 2009. Naperville was the **only Illinois project**, and one of only a handful of communities, to receive funding. The project scope consisted of 58,407 Smart Meters and AMI Communications (RF Mesh with a Fiber Backhaul), a Meter Data Management System, and Distribution Equipment for 6 out of 117 Distribution Circuits.

Important to note, is not only the successful implementation and utilization of funds to execute on the projects defined in its original SGIG application, but how Naperville leveraged that initial Federal funding investment to continuously improve and build upon. In its original plans in 2009, NEU had identified several future objectives which would leverage the AMI network, including the implementation of Conservation Voltage Reduction (CVR), integration of meter outage data with a GIS, and an asset management system leveraging the AMI meter data. **Through incremental NEU investment**, all these functionalities have been successfully accomplished and implemented and are in service today, demonstrating NEU's ability to manage complex, multi component programs and successfully scale them for the future.

Other Past Smart Grid Projects

Naperville has effectively deployed several projects in recent years of similar size and scope, summarized as follows:

PROJECT NAME	YEAR	DESCRIPTION OF PROJECT SIZE & SCOPE
Fiber & Automation Projects	Various	Naperville has installed over 125 miles of fiber optic cable as well has installed over 137 DA Switches, including 13 DA Switches in 2021-2022, in addition to doing successful 6800 Conversion to 60 DA Switches.
Tropos/Gatekeeper to Cellular Gatekeeper Upgrades	2018- 2022	Naperville has converted 38 existing Tropos/gatekeeper combo locations to Cellular Gatekeepers and deprecated another 62 Tropos/Gatekeeper combos in the past 5 years to improve communication reliability of AMI infrastructure
SCADA RTU Upgrades	Various	Naperville completed SCADA remote terminal units' replacements at both Chicago and Ogden substations. General scope for the project involves the following: • Removing the old ACS NTU equipment from • Installing the new SEL-AXION I/O platform • Upgrading the SEL-RTU as required • Programming the SEL-RTU to make use of the already installed HMI equipment. • Replacing old meters with SEL-735 meters as required at the stations.
Conservation Voltage Reduction (CVR) Implementation	Various	This program has been deployed to all 12kV transformers in the Naperville electric system and is providing energy and demand savings to the electric utility and its customers. The CVR program ultimately achieves financial savings by using real-time smart grid data provided by AMI to optimize the voltage.

UTILITY AWARDS & RECOGNITIONS

Over the past several years, NEU has been formally recognized through several awards and designations in its energy efficiency commitments, safety and reliability commitments, and solar expansion commitments, summarized as follows:

- In 2020, NEU earned a **Reliable Public Power Provider (RP3)® Platinum designation** from the American Public Power Association (APPA) for providing reliable and safe electric service. APPA's RP3 program is based on industry-recognized leading practices in four important disciplines – Reliability, Safety, Workforce Development, & System Improvement. Currently 274 of the nation's more than 2,000 public power utilities hold a RP3 designation.
- NEU has earned the **Smart Energy Provider (SEP) designation** from the American Public Power Association (APPA). This two-year award recognizes the Utility for demonstrating commitment and proficiency in energy efficiency, distributed generation and environmental initiatives.
- **2019 SolSmart Silver Designation**. Naperville earned at least 100 points for adopting solar best practices across eight (8) strategic SolSmart activities. These include updating ordinances to allow solar development in the community more broadly, and training inspection staff on best practices for permitting and inspecting solar systems.

FACILITIES, EQUIPMENT, & MATERIALS

The proposed solution is a software-based application which requires integrations to additional NEU systems. On-site work will be performed at NEU-owned facilities. With that, the project will be less reliant on procurement of materials & equipment to successfully execute, and more reliant on ensuring the appropriate integration resources, both internal to NEU & the vendor are available.